

*Contribution*  
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REVIEWS

MEASURING THE PRODUCTION OF MARINE PHYTOPLANKTON. By J. D. H. Strickland. (Fisheries Research Board of Canada, Bulletin No. 122). The Queen's Printer, Ottawa. 1960. 172 pp., 9 tables \$2.00.

The author states that there is "no comprehensive and critical review of marine primary productivity that serves as an adequate introduction to the subject in all its aspects for workers about to commence active research in this field." In this publication the author attempts to satisfy this need by presenting in clear, concise language an excellent introduction to the measurement of primary productivity of marine phytoplankton. Not only is he successful in providing a valuable text for new workers, but also he raises questions which might profitably be further examined by researchers already in the field.

The publication is divided into five sections. A table of contents, a glossary of symbols and abbreviations, introductory remarks, and an extensive bibliography are also included.

In any introductory text an author is confronted with the problem of using terms, which although familiar to the experienced worker, are unknown to the neophyte. The author, realizing this, has devoted an entire section to a compact, yet thorough, discussion of definitions and conversion factors.

In a discussion of the chemical composition of phytoplankton in Section II the author adequately covers the elementary composition, the major molecular constituents, and the pigments used in measuring primary productivity. Briefly covered in each instance is a review of the literature, the relationship between constituents, the degree of variations in measurements and their causes, and the limitations of values determined for each constituent as used in reporting the findings. Possible solutions for some of the problems which arise when measuring chemical composition of phytoplankton are given, and several techniques with their limitations used for obtaining these measurements are introduced.

The primary problem of measuring a standing crop of organisms is to obtain a representative sample of a population which is distributed unevenly over an extensive area. In Section III the author covers the problem of gear selection, of processing the sample, and of separating phytoplankton from all organic matter of animal origin and detritus. This is followed by a discussion of the techniques employed in estimating primary productivity from carbon content, nitrogen, phosphorus, and specific organic constituents, and by pigment analysis. Discussing each phase separately, the author provides a brief review of the literature succeeded by a discussion of the limitations. This section is terminated with a discussion of some results of standing crop determination obtained by various workers.

Section IV, a discussion of the measurement of the rate of photosynthesis, is by far the best portion of the text. Introducing this topic, the author provides an informative discussion of oxygen and carbon dioxide requirements and relationships, photosynthetic and respiratory quotients, effects of illumination on respiratory algae, and participation of intracellular

though slightly repetitious of Section III, this additional coverage is beneficial to the neophyte in that it provides further insight into the problems encountered in the field and laboratory. Having presented this background information, the author then covers the measurement of the rate of photosynthesis by carbon dioxide consumption, the oxygen evaluation (dark and light bottle), the rate of carbon-14 uptake, methods based on pigment content, and finally by other methods which involve depth profiles of oxygen or phosphorus concentrations and the uptake of phosphorus. In each instance he provides a brief review of the literature, general techniques, limitations, and special considerations to be taken into account. Terminating the discussion of measuring the rate of photosynthesis, the author provides a table and brief discussion of selected examples of productivity measurements.

Section V is "a detailed discussion of the measurement of primary productivity in nature and of methods designed to predict *in situ* productivity with the minimum amount of experimentation." Before delving into this subject, the author provides a brief discussion of the concept of the productivity index of a water mass. Then, in a discussion of general kinetics, the author covers the kinetics of unicellular growth and decay, the influence of light, and the diurnal fluctuation of organisms as related to timing of experiment. Concluding the text, productivity measurement in nature is presented with the author providing additional observations on population changes in nature and the *in situ* production and its prediction from experimental work using light incubators.

Mr. Strickland has shown that he is well acquainted with his field, and the direct, clear manner in which the material is presented is to be commended. The reference section, although not covering the entire field, is an adequate introduction to the beginner as well as a useful tool to the experienced worker.

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RATE OF METABOLISM AND FOOD REQUIREMENTS OF FISHES. By G. G. Winberg. (Fisheries Research Board of Canada, Translation Series No. 194). (Published in *Nauchnye Trudy Belorusskovo Gosudarstvennogo Universiteta imeni V. I. Lenina, Minsk*, 253 pp., 1956). Fisheries Research Board of Canada, Biological Station, Nanaimo, B. C. 1960. 202 pp., 54 figs., 32 tables.

This translation of G. G. Winberg's monograph represents a cooperative enterprise of the Fisheries Research Board of Canada, the Department of Zoology of the University of Toronto, and the Research Division of the Ontario Department of Lands and Forests.

Much of the monograph is devoted to reviewing the various relationships of the metabolic rate of fish to factors such as temperature, the oxygen con-